

WE CLAIM AS OUR INVENTION:

1. A duplexer for separating transmitted and received signals of a defined frequency band comprising:

an antenna port, a reception output, and a transmission input;

a reception path connected between said antenna port and said reception output;

a transmission path connected between said antenna port and said reception input;

a reception bandpass filter connected in said reception path;

a transmission bandpass filter connected in said transmission path; and

said antenna port being asymmetrical and said reception output being symmetrical.

2. A duplexer as claimed in claim 1 wherein said reception bandpass filter has an asymmetrical output, and comprising a balun connected between said reception bandpass filter and said reception output.

3. A duplexer as claimed in claim 1 wherein said transmission input is asymmetrical.

4. A duplexer as claimed in claim 1 wherein said transmission input is symmetrical.

5. A duplexer as claimed in claim 4 wherein said transmission bandpass filter has a symmetrical input.

6. A duplexer as claimed in claim 4 wherein said transmission bandpass filter has an asymmetrical input, and comprising a balun connected between said transmission bandpass filter and said transmission input.

7. A duplexer as claimed in claim 1 wherein said antenna port has an impedance that is different from an impedance of at least one of said reception output and said reception input.

8. A duplexer as claimed in claim 1 wherein an input impedance of at least one of said transmission bandpass filter and said reception bandpass filter is different from an output impedance thereof.

9. A duplexer as claimed in claim 8 wherein said input and output impedance differ by at least a factor of two.

10. A duplexer as claimed in claim 1 wherein at least one of said transmission bandpass filter and said reception bandpass filter comprises a transformer selected from the group consisting of a surface acoustic wave transformer, a microwave ceramic resonator and an LC resonator.

11. A duplexer as claimed in claim 1 wherein at least one of said transmission bandpass filter and said reception bandpass filter comprises a volume acoustic wave resonator.

12. A duplexer as claimed in claim 1 comprising a substrate at which said antenna port, said reception output, said transmission input, said reception path, said transmission path, said reception bandpass filter and said transmission bandpass filter are disposed, said substrate comprising at least one dielectric layer and at least one metallized layer disposed adjacent to said dielectric layer.

13. A duplexer as claimed in claim 12 comprising an adapter network connected in at least one of said reception path and said transmission path at a side of said antenna port.

14. A duplexer as claimed in claim 13 wherein said adapted network is connected in said reception path, and comprises an adapted transformation line.

15. A duplexer as claimed in claim 13 wherein at least one of said transmission bandpass filter, said reception bandpass filter and said adapter network is formed by a portion of said metallization level of said substrate.

16. A duplexer as claimed in claim 13 wherein at least one of said transmission bandpass filter, said reception bandpass filter and said adapter network is a chip disposed on said substrate.

17. A duplexer as claimed in claim 16 wherein said chip is electrically connected to said substrate by an electrical connection selected from the group consisting of bond wires and solder bumps.

18. A duplexer as claimed in claim 12 wherein said dielectric layer of said substrate is composed of a material selected from the group consisting of ceramics and laminated materials.

19. A duplexer as claimed in claim 1 comprising an adapter network connected in at least one of said reception path and said transmission path, at a side of said antenna port.

20. A duplexer as claimed in claim 19 wherein said adapter network is disposed in said reception path, and comprises an adapted transformation line.

21. A duplexer as claimed in claim 1 wherein at least one of said transmission bandpass filter and said reception bandpass filter comprises an element of an arrangement selected from the group consisting of ladder arrangements and lattice arrangements.

22. A duplexer as claimed in claim 1 wherein at least one of said transmission bandpass filter and said reception bandpass filter comprises a plurality of volume acoustic wave resonators superimposed on each other in a stack and coupled to each other by a coupling selected from the group consisting of acoustic

couplings and electrical couplings, and wherein each of said volume acoustic wave resonators comprises a piezoelectric layer disposed between two electrodes.

23. A duplexer as claimed in claim 21 wherein volume acoustic wave resonators that are adjacent to each other in said stack share a common electrode.

24. A duplexer as claimed in claim 1 further comprising insulation disposed between said transmission path and said reception path for producing a separation greater than 40 dB between said transmission path and said reception path.

25. A duplexer as claimed in claim 1 comprising a phase shifter connected in said transmission path between said antenna port and said transmission bandpass filter for separating transmitted and received signals at said antenna port into said transmission path and reception path, respectively.

26. A duplexer as claimed in claim 1 comprising a phase advancer connected in said reception path between said antenna port and said reception bandpass filter, for separating transmitted and received signals at said antenna port into said transmission path and said reception path, respectively.

27. A duplexer as claimed in claim 1 comprising an impedance transformer connected in said transmission path at a location selected from the group consisting of preceding said transmission bandpass filter and after said transmission bandpass filter.

28. A duplexer as claimed in claim 1 comprising an impedance transformer connected in said reception path at a location selected from the group consisting of preceding said reception bandpass filter and after said reception bandpass filter.